SPECIES GOALS AND CONSERVATION MEASURES

Species with the designation "Recovery."

DELTA SMELT

MSCS SPECIES GOAL PRESCRIPTION: Distribution Criteria: The fall mid-water trawl survey in September and October must capture delta smelt in all zones in 2 out of 5 consecutive years and in at least 2 zones in 3 out of the 5 consecutive years, and in at least 1 zone in all 5 years; and the 5 consecutive years must include 2 sequential extreme outflow years (i.e., at least one critical or dry year followed by a critical, dry, or wet year). Abundance Criteria: the fall mid-water trawl catch for September and October must exceed 239 for 2 out of 5 years and not fall below 84 for more than 2 consecutive years.

MSCS CONSERVATION MEASURES: The following conservation measures are included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve delta smelt species habitat or population targets.

- Coordinate protection, enhancement, and restoration of occupied delta smelt habitats with other federal, state, and regional programs (e.g., the San Francisco Bay Area Wetlands Ecosystem Goals Project, the Anadromous Fish Restoration Program, and the U.S. Fish and Wildlife Service recovery plans) that could affect management of current and historic habitat use areas to avoid potential conflicts among management objectives and identify opportunities for achieving multiple management objectives.
- To the extent consistent with CALFED objectives, direct ERP actions towards setting back levees in the south Delta to increase shallow water habitat.
- Restore and enhance delta smelt habitat to provide suitable water quality (i.e., low concentrations of pollutants) and substrates for egg attachment (submerged tree roots, branches, rock, and emergent vegetation) to important spawning areas.
- Expand Interagency Ecological Program (IEP) monitoring efforts in the south Delta for delta smelt.
- To the extent consistent with CALFED objectives, initiate implementation of the USFWS' "Rainbow Report" or similar documentation to provide increased water quality in the south Delta and eliminate or reduce the need for installation of barriers.
- Monitor to determine if artificial substrates are used by delta smelt for spawning.
- Protect critical rearing habitat from high salinity (>2 ppt) and high concentrations of pollutants from February 1 to August 31.
- Allow delta smelt unrestricted access to suitable spawning habitat and protect these areas from physical disturbance (e.g., heavy equipment operation) and flow disruption in the period from December to July by maintaining adequate flow and suitable water quality to attract migrating adults in the Sacramento and San Joaquin River channels and their tributaries, including Cache and Montezuma sloughs and their tributaries.
- All in-channel modification projects implemented under CALFED should use best management practices to minimize mobilization of sediments that might contain toxins, localize sediment movement, and reduce turbidity.

RATIONALE: *The recovery objective for delta smelt is to remove delta smelt from the Federal list of threatened species through restoration of it abundance and distribution. Recovery of delta smelt should not be at the expense of other native fishes. The basic strategy for recovery is to manage the estuary in such a way that it is a better habitat for native fish in general and delta smelt in particular. Improved habitat will allow delta smelt to be widely distributed throughout the Delta and Suisun Bay, recognizing that areas of abundance change with season.*

Recovery of delta smelt will consist of two phases, restoration and delisting. Separate restoration and delisting periods were selected because it is possible

that restoration criteria could be met quicky in the absence of consecutive extreme outflow years (i.e., extremely wet or dry years). However, without the population being tested by extreme outflows there is no assurance of long-term survival for the species.

Thus restoration is defined as a return of the population to pre-decline levels, but delisting is not recommended until the population has been tested by extreme outflows. Delta smelt will be considered restored when its population dynamics and distribution pattern within the estuary are similar to those that existed in the 1967-1981 period. This period was chosen because it includes the earliest continuous data on delta smelt abundances and was a period in which populations stayed reasonably high in most years. The species will be considered recovered and qualify for delisting when it experiences a five-year period that includes two sequential years of extreme outflows, one of which must be dry or critically dry. Delta smelt will be considered for delisting when the species meets recovery criteria under stressor conditions comparable to those that led to listing and mechanisms are in place that insure the species' continued existence.

Improved spring inflow and outflow should benefit the population by providing attraction flow to adults moving into the Delta to spawn, by stimulating aquatic foodweb production to help ensure young delta smelt survival, and by providing transport flow to larval delta smelt to move them from the Delta into prime nursery habitat in the western Delta and Suisun Bay. Improving channel hydraulics would increase the aquatic foodweb and improve spawning and rearing habitat. Reducing the effects of water diversions and contaminants would help to improve survival of young and adult delta smelt.

LONGFIN SMELT

MSCS SPECIES GOAL PRESCRIPTION: The recovery goal will be achieved when 1) the fall mid-water trawl surveys in September and October result in the capture of longfin smelt in all zones in 5 out of 10 years, 2) in 2 zones for an additional year, 3) in at least one zone during 3 of the 4 remaining years in the 10 year period with no failure to meet site criteria in consecutive years, and 4) abundance must be equal to or greater that predicted abundance for 5 of the 10 year period.

MSCS CONSERVATION MEASURES: The following conservation measures are included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve longfin smelt species habitat or population targets.

- Coordinate protection, enhancement, and restoration of occupied longfin smelt habitats with other federal, state, and regional programs (e.g., the San Francisco Bay Area Wetlands Ecosystem Goals Project, the Anadromous Fish Restoration Program, and the U.S. Fish and Wildlife Service recovery plans) that could affect management of current and historic habitat use areas to avoid potential conflicts among management objectives and identify opportunities for achieving multiple management objectives.
- Improve January and February flows for the longfin smelt during the second and subsequent years of drought periods.
- Provide sufficient Delta outflows for the longfin smelt during December through March.
- Provide suitable water quality and substrates for egg attachment (submerged tree roots, branches, rock, and emergent vegetation) to spawning areas in the Delta and tributaries of northern Suisun Bay.
- Provide unrestricted access to suitable spawning habitat and protect these areas from physical disturbance (e.g., heavy equipment operation) and flow disruption in the period from December to July by maintaining adequate flow and suitable water quality to attract migrating adults in the Sacramento and San Joaquin River channels and their tributaries, including Cache and Montezuma sloughs and their tributaries.
- Conduct research to determine the relationship between X2 and longfin smelt abundance and distribution.
- Consistent with CALFED objectives, mobilize organic carbon in the Yolo Bypass to improve food supplies by ensuring flow through the bypass at least every other year.
- Consistent with CALFED objectives, operate diversions to minimize adverse affects of

diversions on longfin smelt during the peak spawning period (January - March).

- To the extent consistent with CALFED objectives protect the Sacramento and San Joaquin river and tributary channels from physical disturbance (e.g., sand and gravel mining, diking, dredging, and levee or bank protection and maintenance) and flow disruption (e.g., water diversion that result in entrainment and in-channel barriers or tidal gates) for the period February 1 to August 31.
- Protect critical rearing habitat from high salinity (>2 ppt) and high concentration of pollutants from the beginning of February to the end of August.

***RATIONALE**: General restoration objectives are the same as those described for delta smelt. Longfin smelt will be considered restored when its population dynamics and distribution patterns within the estuary are similar to those that existed in the 1967-1984 period. This period was chosen because it includes the earliest continuous data on longfin smelt abundances and was a period in which populations stayed reasonably high in most years.*

Meeting the targets of the Native Fish Recovery Plan will indicate an increase in the longfin smelt population. Without such an increase in the population, there would be no guarantee that recovery is occurring. Improved spring inflow and outflow should benefit the population by providing attraction flow to adults moving into the Delta to spawn, by stimulating aquatic foodweb production to help ensure young longfin smelt survival, and by providing transport flow to larval longfin smelt to move them from the Delta into prime nursery habitat in the western Delta and Suisun Bay.

Improving channel hydraulics would increase the aquatic foodweb and improve spawning and rearing habitat. Reducing the effects of water diversions and contaminants would help to improve survival of young and adult longfin smelt. Reevaluation of stocking striped bass and chinook salmon into prime nursery habitats of longfin smelt in San Pablo Bay and Suisun Bay would reduce predation on young longfin smelt. Alternative locations and time of stocking may limit predation on longfin smelt.

GREEN STURGEON

MSCS SPECIES GOAL PRESCRIPTION: The recovery goal will be achieved when 1) the median population of mature fish (over 1 meter in length) has reached 1,000 fish, including 500 females over 1.3 meters in total length, over a 50 years period or for 5 generations.

MSCS CONSERVATION MEASURES: The following conservation measures are included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve green sturgeon species habitat or population targets.

- Coordinate protection, enhancement, and restoration of occupied and historic green sturgeon habitats with other federal, state, and regional programs (e.g., the San Francisco Bay Area Wetlands Ecosystem Goals Project, the Anadromous Fish Restoration Program, the U.S. Fish and Wildlife Service recovery plans, the SB 1086 program, and the Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historic habitat use areas to avoid potential conflicts among management objectives and identify opportunities for achieving multiple management objectives.
- Provide inflows to the Delta from the Sacramento River greater than 25,000 cfs during the March to May spawning period in at least 2 of every 5 years.
- Identify and implement measures to eliminate stranding of green sturgeon in the Yolo Bypass or to return stranded fish to the Sacramento River.
- Conduct research in the MSCS focus area to determine green sturgeon habitat requirements, distribution, spawning habitat flow requirements, and factors limiting population abundance.

***RATIONALE**: Green sturgeon will be considered restored in the Sacramento-San Joaquin estuary once the median population of mature individuals (over 1 meter total length) has reached 1,000 individuals (including 500 females over 1.3 meters total length) over a 50 year period or for five generations (10 years*

is the minimum age of sexual maturity). If population estimates are fewer that 1,000 fish for more than three years in a row, the restoration period will be restarted. (Note: This definition is subject to revision as more information becomes available.) Restoration will be measured by determining population sizes from tagging programs or other suitable means. The present sturgeon tagging programs, which focus on white sturgeon, are inadequate for determining accurately the abundance of green sturgeon. Therefore, a median population goal of 1,000 fish over 1 meter total length (including 500 females over 1.3 meters total length) is achievable with numbers determined through a monitoring program that focuses specifically on green sturgeon. Thus, the first restoration criterion will be establishment–of an adequate population determination through a monitoring program. Once that program is in place, the minimum population goals can be re-evaluated and a realistic, presumably higher, goal established. It may be desirable to have the numbers high enough to support the removal of a minimum of 50 fish over 1 meter total length per year by a fishery (assuming an exploitation rate of 5 percent is sustainable) (U.S. Fish and Wildlife Service 1996).

Improved spring inflow and outflow should benefit the populations by providing attraction flow to adults moving through the Delta into the rivers to spawn, by stimulating aquatic foodweb production to help ensure young sturgeon survival, and by providing transport flow to larval sturgeon to move them from the rivers into prime nursery habitat in the Delta and Suisun Bay. Improving channel hydraulics would increase the aquatic foodweb and improve juvenile rearing habitat. Reducing the effects of water diversions and contaminants would help to improve survival of young and adult sturgeon.

SPLITTAIL

MSCS SPECIES GOAL PRESCRIPTION: Species recovery objectives will be achieved when 2 of the following 3 criteria are met in at least 4 of every 5 years for a 15-year period: 1) the fall mid-water trawl survey numbers must be 19 or greater for 7 of 15 years, 2) Suisun Marsh catch per trawl must be 3.8 or greater and the catch of young-of-year must exceed 3.1 per trawl for 3 of 15 years, and 3) Bay Study otter trawls must be 18 or greater AND catch of young-of-year must exceed 14 for 3 out of 15 years.

MSCS CONSERVATION MEASURES: The following conservation measures are included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve splittail species habitat or population targets.

- Coordinate protection, enhancement, and restoration of occupied and historic Sacramento splittail habitats with other federal, state, and regional programs (e.g., the San Francisco Bay Area Wetlands Ecosystem Goals Project, the Anadromous Fish Restoration Program, the U.S. Fish and Wildlife Service recovery plans, the SB 1086 program, and the Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historic habitat use areas to avoid potential conflicts among management objectives and identify opportunities for achieving multiple management objectives.
- To the extent consistent with CALFED objectives, remove diversion dams that block splittail access to lower floodplain river spawning areas.
- Minimize changes in the timing and volume of freshwater flows in the rivers to the Bay-Delta.
- To the extent consistent with CALFED objectives, direct ERP actions towards setting back levees in the south Delta to increase shallow water habitat.
- To the extent consistent with CALFED objectives, reduce the extent of reversed flows in the lower San Joaquin and Delta during the period from February through June.
- Reduce loss of splittail at south Delta pumping plants from predation and salvage handling and transport.
- Reduce the loss of young splittail to entrainment into south Delta pumping plants.
- To the extent practicable, reduce the loss of splittail at 1,800 unscreened diversions in the Delta.
- Reduce losses of adult splittail spawners during their upstream migration to recreational fishery harvest.

- To the extent consistent with CALFED objectives, improve Delta water quality particularly in dry years when pesticide levels and total dissolved solids are high.
- To the extent consistent with CALFED objectives, modify operation of the Delta Cross Channel to minimize potential to increase exposure of splittail population in the Delta to the south Delta pumping plants.
- Modify operation of the barrier at the Head of Old River to minimize the potential for drawing splittail toward the south Delta pumping plants.
- To the extent practicable, design and construct overflow basins from existing leveed lands in stages using construction design and operating schemes and procedures developed through pilot studies and project experience to minimize the potential for stranding as waters recede from overflow areas.
- Consistent with CALFED objectives, design modifications to South Delta channels to improve circulation and transport of north of Delta water to the south Delta pumping plants to ensure habitat supports splittail and to not increase transport of splittail to the south Delta pumping plants.
- To the extent practicable with CALFED objectives, design seasonal wetlands that have hydrological connectivity with occupied channels to reduce the likelihood for stranding and to provide the structural conditions necessary for spawning.
- To the extent consistent with CALFED objectives, protect spawning areas by providing suitable water quality (i.e., low concentrations of pollutants) and substrates for egg attachment (e.g., submerged tree roots and branches and emersed and submerged vegetation).
- Avoid or minimize adverse effects on rearing habitat of physical disturbance (e.g., sand and gravel mining, diking, dredging, and levee or bank protection and maintenance) and flow disruption (e.g., water diversions, in-channel barriers, or tidal gates).
- To the extent consistent with CALFED objectives, maintain a low salinity zone in historical occupied habitat areas of the Bay and Delta from February 1 to August 31.
- To the extent consistent with CALFED objectives, provide unrestricted access of adults to spawning habitat from December to July by maintaining adequate flow and water quality, and minimizing disturbance and flow disruption.
- Expand the IEP monitoring efforts in the south Delta for Sacramento splittail.
- To the extent consistent with CALFED objectives, initiate implementation of the USFWS' "Rainbow Report" or similar documentation to provide increased water quality in the south Delta and eliminate or reduce the need for installation of barriers.
- To the extent consistent with CALFED objectives, reduce the effects on splittail from changes in reservoir operations and ramping rates for flood control.
- To the extent consistent with CALFED objectives, reduce the loss of freshwater and low-salinity splittail habitat in the Bay-Delta as a result of reductions in Delta inflow and outflow.
- To the extent consistent with CALFED objectives, increase the frequency of flood bypass flooding in non-wet years to improve splittail spawning and early rearing habitat.
- To the extent consistent with CALFED objectives, ensure that the Yolo and Sutter Bypasses are flooded during the spawning season at least once every 5 years.
- To the extent consistent with CALFED objectives, improve the frequency, duration, and extent of bypass flooding in all years.
- Develop a water management plan to allocated multiyear water supply in reservoirs to protect drought year supplies and sources of winter-spring Delta inflow and outflow needed to sustain splittail and their habitat.

***RATIONALE**: Improved spring inflow and outflow should benefit the population by providing attraction flow to adults moving upstream into the Delta and rivers to spawn, by increasing flooding of riparian vegetation and flood plain processes which provide important spawning habitat of splittail, by*

stimulating aquatic foodweb production to help ensure young splittail survival. Improving channel hydraulics would increase the aquatic foodweb and improve spawning and rearing habitat. Improving shallow water, slough, and wetland habitats should increase the spawning and rearing habitat of splittail. Reducing the effects of water diversions and contaminants would help to improve survival of young and adult splittail.

SACRAMENTO WINTER-RUN CHINOOK SALMON ESU

MSCS SPECIES GOAL PRESCRIPTION: The mean annual spawning abundance over any 13 consecutive years will be 10,000 females. The geometric mean of the Cohort Replacement Rate over those same 13 years will be greater than 1.0. Estimates of these criteria will be based on natural production alone and will not include hatchery-produced fish. If the precision for estimating spawning run abundance has a standard error greater than 25%, then the sampling period over which the geometric mean of the Cohort Replacement Rate is estimated will be increased by 1 additional year for each 10% of additional error over 25%.

MSCS CONSERVATION MEASURES: The following conservation measures are included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve species habitat or population targets.

- Coordinate protection, enhancement, and restoration of occupied and historic chinook salmon habitats with other federal, state, and regional programs (e.g., the San Francisco Bay Area Wetlands Ecosystem Goals Project, the Anadromous Fish Restoration Program, the U.S. Fish and Wildlife Service recovery plans, the SB 1086 Program, and the Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historic habitat use areas to avoid potential conflicts among management objectives and identify opportunities for achieving multiple management objectives.
- Implement management measures identified in the proposed recovery plan for the Sacramento River winter-run chinook salmon.
- To the extent consistent with CALFED objectives, manage operations at the Red Bluff diversion dam to improve fish passage, reduce the level of predation on juvenile fish, and increase fish survival.

RATIONALE: *The goal of the Sacramento River winter-run chinook salmon is to establish a framework for the recovery of the population through a logical program of improving the habitat and environment of the species. Specifically, the recovery of this species requires actions which increase their abundance and improve their habitat to the point that the probability of subsequent extinction will be very low. When the underlying causes of the species' decline are no longer in effect and the species has rebounded to relatively healthy levels, winter-run chinook can be removed from the list of threatened and endangered species; that is, it can be "delisted."*

An extinction model was used to develop the delisting criteria to ensure a low probability of extinction once the criteria have been reached. The risk level chosen was a probability of less than 0.1 within the 50 years following delisting. Assurance of the probability of extinction required specification of the population growth rate in addition to population abundance.

Improved spring inflow and outflow should benefit the populations by providing attraction flow to adults moving through the Delta into the rivers to spawn, by stimulating aquatic foodweb production to help ensure young survival, and by providing transport flow to juvenile salmon to move them from the rivers into prime nursery habitat in the Delta and Bay. Improving channel hydraulics would increase the aquatic foodweb and improve juvenile rearing habitat. Reducing the effects of water diversions and contaminants would help to improve survival of young and adult salmon.

SACRAMENTO SPRING-RUN CHINOOK SALMON ESU

MSCS SPECIES GOAL PRESCRIPTION: The Central Valley spring-run chinook salmon Evolutionarily Significant Unit (ESU) will be regarded as restored when the ESU meets specific viability criteria to be established in the NMFS recovery plan for Central Valley salmonids. Viability of the Central Valley spring-run ESU will be assessed according to the "Viable Salmonid Populations"

(VSP) framework developed by the NMFS. The framework deals with four population characteristics:

1. **ABUNDANCE:** populations are large enough to resist extinction due to random environmental, demographic and genetic variation.
2. **PRODUCTIVITY:** populations have enough reproductive capacity to ensure resistance to episodes of poor freshwater or ocean conditions and the ability to rebound rapidly during favorable periods, without the aid of artificial propagation.
3. **SPATIAL DISTRIBUTION:** populations are distributed widely and with sufficient connectivity such that catastrophic events do not deplete all populations and stronger populations can rescue depleted populations.
4. **DIVERSITY:** populations have enough genetic and life history diversity to enable adaptation to long-term changes in the environment. Populations achieve sufficient expression of historic life history strategies (migration timing, spawning distribution), are not negatively impacted by outbreeding depression resulting from straying of domesticated hatchery fish, and are not negatively impacted by inbreeding depression due to small population size and inadequate connectivity between populations.

The NMFS recovery planning for Central Valley salmonids will proceed in two phases. The first phase will be conducted by a technical recovery team (TRT) that will produce numeric recovery criteria for populations and the ESU following the VSP framework, factors for decline, early actions for recovery, and provide plans for monitoring and evaluation. The TRT will review existing salmonid population recovery goals and management programs being implemented by federal and State agencies and will coordinate with agency scientists, CALFED staff and Central Valley science/restoration teams such as the Interagency Ecological Program work teams during this first phase. TRT products will be peer-reviewed and made available for public comment.

The second phase will be identification of recovery measures and estimates of cost and time required to achieve recovery. The second phase will involve participation by agency and CALFED staff as well as involvement by a broad range of stakeholders, including local and private entities, with the TRT providing technical guidance on biological issues.

MSCS CONSERVATION MEASURES: The following conservation measures are included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve species habitat or population targets.

- Coordinate protection, enhancement, and restoration of occupied and historic chinook salmon habitats with other federal, state, and regional programs (e.g., the San Francisco Bay Area Wetlands Ecosystem Goals Project, the Anadromous Fish Restoration Program, the U.S. Fish and Wildlife Service recovery plans, the SB 1086 Program, and the Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historic habitat use areas to avoid potential conflicts among management objectives and identify opportunities for achieving multiple management objectives.
- Implement applicable management measures identified in the restoration plan for the Anadromous Fish Restoration Program and the recovery plan for the native fishes of the Sacramento/San Joaquin Delta.
- To the extent consistent with CALFED objectives, operate existing inchannel barriers and any new barriers that may be constructed to avoid changes in Delta channel hydraulics that increase the number of fish or proportions of fish populations drawn toward the pumps or affected by poor water quality.
- Manage operations at the Red Bluff diversion dam to improve fish passage, reduce the level of predation on juvenile fish, and increase fish survival.

***RATIONALE**: Spring-run chinook salmon are listed as a threatened species under the California Endangered Species Act and proposed for listing under the ESA. Because of their life history patterns, spring-run chinook enter the Sacramento River early in the year and ascend to tributaries where they oversummer to spawn during the following fall. Young fish may rear for a year or longer in the*

tributaries before entering the Sacramento River during their seaward migration.

The status of a spring-run chinook salmon in the mainstem Sacramento River is uncertain, however, evidence suggests that there may be a significant introgression with fall-run chinook. The role of the Sacramento River in sustaining spring-run chinook salmon is primarily to provide adult fish passage to the tributary streams and to provide rearing and emigration habitat for juveniles during their seaward migration.

Natural populations and their essential habitat must be sufficiently abundant to ensure Sacramento River spring-run chinook salmon's long-term survival. In order to achieve recovery, the remaining natural, non-introgressed populations of spring run and any re-established natural populations must be protected, monitored, and proven to be self-sustaining to the satisfaction of the Department of Fish and Game and the Fish and Game Commission. Recovery goals must ensure that the individual populations, as well as the collective metapopulation, are sufficiently abundant to avoid genetic risks of small population size. Thus, recovery goals need to address abundance levels (adult spawning escapements), population stability criteria, population distribution, and length of time for determining sustainability.

The California Department of Fish and Game's recovery objectives for Sacramento River spring-run chinook salmon are (1) the protection and enhancement of the existing natural populations; (2) the re-establishment of additional, viable native populations; and (3) the restoration and protection of natal, rearing, and migratory streams within the Sacramento River basin (California Department of Fish and Game 1998).

The U.S. Fish and Wildlife Service (1996) has recommended restoration objectives and criteria for Sacramento River spring-run chinook salmon based on the objective of establishing self-sustaining populations which will persist indefinitely for each species addressed. Additionally, the population goals for chinook salmon runs include extra adult production for allowing sustained limited harvests of each run. The plan states that restoration will be measured by three interacting criteria: (1) presence of self-sustaining spawning populations in Mill and Deer creeks; (2) total number of spawners in Mill, Deer, Antelope, Butte, Big Chico, Beegum, South Fork Cottonwood, and Clear creeks (if the Yuba River proves to still have a natural run of spring-run chinook, the population goal should be raised by whatever number of spawners the stream can support); and (3) smolt survival through the Delta.

Spring-run chinook salmon populations will be considered healthy when the average number of spawners in tributary streams to the Sacramento River exceeds 5,000 fish each year over a 15-year period (five generations times 3 years per generation), with 3 of the 15 years being dry or critically dry. The average number of natural, wild spawners over the 15-year period must not be fewer than 8,000 fish (USFWS 1996).

SACRAMENTO LATE-FALL-RUN CHINOOK SALMON

SPECIES TARGETS: Achieve species recovery by 1) increasing the number of wild spawning fish in the Sacramento River to a mean number of 22,000 fish and maintain the population such that it does not drip below 15,000 fish for 15 years, 3 of which are dry or critical and 2) achieving juvenile survival rates that approach pre-CVP and SWP levels following years when the adult populations are fewer that 15,000 fish in the Sacramento River (U.S. Fish and Wildlife Service 1996).

Note: The Central Valley fall/late fall-run ESU is a candidate species, not a threatened or endangered species, under the ESA. The NMFS recovery plan for Central Valley salmonids will therefore not include formal recovery goals for populations in this ESU. The recovery plan for Central Valley salmonids will identify factors of concern and measures to ensure the long-term conservation of the Central Valley fall/late fall-run ESU and recovery actions proposed for listed ESUs will be evaluated to ensure that they do not place non-listed species at significant risk. CALFED, DFG and the NMFS will work together to identify restoration goals following the VSP framework in a process separate from the NMFS recovery planning process. These goals will aim to ensure the long-term viability of Sacramento and San Joaquin fall-run and Sacramento late fall-run chinook salmon.

MSCS CONSERVATION MEASURES: The following conservation measures are included in the Multi-Species Conservation Strategy (2000) to

provide additional detail to ERP actions that would help achieve species habitat or population targets.

- Coordinate protection, enhancement, and restoration of occupied and historic chinook salmon habitats with other federal, state, and regional programs (e.g., the San Francisco Bay Area Wetlands Ecosystem Goals Project, the Anadromous Fish Restoration Program, the U.S. Fish and Wildlife Service recovery plans, the SB 1086 Program, and the Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historic habitat use areas to avoid potential conflicts among management objectives and identify opportunities for achieving multiple management objectives.
- Implement applicable management measures identified in the restoration plan for the Anadromous Fish Restoration Program and the recovery plan for the native fishes of the Sacramento/San Joaquin Delta.
- Operate hatcheries such that the maintenance, and expansion of natural populations are not threatened by the release of hatchery fish.
- To the extent consistent with CALFED objectives, manage operations at the Red Bluff diversion dam to improve fish passage, reduce the level of predation on juvenile fish, and increase fish survival.
- To the extent consistent with CALFED objectives, manage export flows from the San Joaquin River to improve conditions for upstream migration of adult fish (i.e., attraction flows).
- To the extent consistent with CALFED objectives, operate physical barriers in the Delta in a manner to assist in achieving recovery goals.
- Continue research to determine causes for low outmigration survival of fish from the San Joaquin River in the south Delta and identify and implement measures to improve outmigration survival.

RATIONALE: *Presently, late-fall-run chinook salmon have no special protection. The great majority of late-fall-run chinook appear to spawn in the mainstem Sacramento River during January, February, and March. Late-fall-run chinook abundance has declined due to passage problems at Red Bluff Diversion Dam, loss of habitat, poor survival of emigrating smolts, sport and commercial harvest, and other factors, such as disease and pollutants.*

FALL-RUN CHINOOK SALMON ESU

MSCS SPECIES GOAL PRESCRIPTION:

San Joaquin Fall Run: Achieve species recovery by 1) increasing the number of naturally spawning fish in the Stanislaus, Tuolumne, and Merced rivers to a median number of 20,000 fish and maintaining a three-year running average that does not drop below 3,000 fish for 15 years, three of which are dry and critical and 2) achieving smolt survival rates that approach pre-CVP and SWP levels when adult numbers decline to fewer that 3,000 natural spawning fish.

Sacramento Fall Run: Restore self-sustaining populations to all their native streams.

Note: The Central Valley fall/late fall-run ESU is a candidate species, not a threatened or endangered species, under the ESA. The NMFS recovery plan for Central Valley salmonids will therefore not include formal recovery goals for populations in this ESU. The recovery plan for Central Valley salmonids will identify factors of concern and measures to ensure the long-term conservation of the Central Valley fall/late fall-run ESU and recovery actions proposed for listed ESUs will be evaluated to ensure that they do not place non-listed species at significant risk. CALFED, DFG and the NMFS will work together to identify restoration goals following the VSP framework in a process separate from the NMFS recovery planning process. These goals will aim to ensure the long-term viability of Sacramento and San Joaquin fall-run and Sacramento late fall-run chinook salmon.

MSCS CONSERVATION MEASURES: The following conservation measures are included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve species habitat or population targets.

- Coordinate protection, enhancement, and restoration of occupied and historic chinook salmon habitats with other federal, state, and regional programs (e.g., the San Francisco Bay

Area Wetlands Ecosystem Goals Project, the Anadromous Fish Restoration Program, the U.S. Fish and Wildlife Service recovery plans, the SB 1086 Program, and the Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of current and historic habitat use areas to avoid potential conflicts among management objectives and identify opportunities for achieving multiple management objectives.

- Implement applicable management measures identified in the restoration plan for the Anadromous Fish Restoration Program and the recovery plan for the native fishes of the Sacramento/San Joaquin Delta.
- Operate hatcheries such that the maintenance, and expansion of natural populations are not threatened by the release of hatchery fish.
- To the extent consistent with CALFED objectives, manage operations at the Red Bluff diversion dam to improve fish passage, reduce the level of predation on juvenile fish, and increase fish survival.
- To the extent consistent with CALFED objectives, manage export flows from the San Joaquin River to improve conditions for upstream migration of adult fish (i.e., attraction flows).
- To the extent consistent with CALFED objectives, operate physical barriers in the Delta in a manner to assist in achieving recovery goals.
- Continue research to determine causes for low outmigration survival of fish from the San Joaquin River in the south Delta and identify and implement measures to improve outmigration survival.

***RATIONALE**: Because of their life-history requirements, typical of all Pacific salmon, Central Valley chinook salmon require high-quality habitats for migration, holding, spawning, egg incubation, emergence, rearing, and emigration to the ocean. These diverse habitats are still present throughout the Central Valley and are successfully maintained to varying degrees by existing ecological processes. Even though the quality and accessibility of the habitats have been diminished by human-caused actions, these habitats can be restored through a comprehensive program that strives to restore or reactivate ecological processes, functions, and habitat elements on a systematic basis, while reducing or eliminating known sources of mortality and other stressors that impair the survival of chinook salmon.*

There are three major programs to restore chinook salmon populations in the Central Valley. The Secretary of the Interior is required by the Central Valley Project Improvement Act (PL 102-575) to double the natural production of Central Valley anadromous fish stocks by 2002 (USFWS 1995). The National Marine Fisheries Service is required under the federal ESA to develop and implement a recovery plan for the endangered winter-run chinook salmon and to restore the stock to levels that will allow its removal from the list of endangered species (NMFS 1996). The California Department of Fish and Game is required under state legislation (the Salmon, Steelhead Trout and Anadromous Fisheries Program Act of 1988) to double the numbers of salmon that were present in the Central Valley in 1988 (Reynolds et al. 1993).

Each of the major chinook salmon restoration /recovery programs has developed specific goals for Central Valley chinook salmon stocks. ERPP embraces each of the restoration/recovery goals and will contribute to each agency's program by restoring critical ecological processes, functions, and habitats, and by reducing or eliminating stressors. ERPP's approach is to contribute to managing and restoring each stock with the goal of maintaining cohort replacement rates of much greater than 1.0 while the individual stocks are rebuilding to desired levels. When the stocks approach the desired population goals, ERP will contribute to maintaining a cohort replacement rate of 1.0.

CENTRAL VALLEY STEELHEAD ESU

MSCS SPECIES GOAL PRESCRIPTION: The Central Valley steelhead Evolutionarily Significant Unit (ESU) will be regarded as restored when the ESU meets specific viability criteria to be established in the NMFS recovery plan for Central Valley salmonids. Viability of the Central Valley steelhead ESU will be assessed according to the "Viable Salmonid Populations" (VSP) framework developed by the NMFS (in review). The framework deals with four population characteristics: